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THIS PATENT APPLICATION IS BEING
FILED WITH SMALL ENTITY STATUS

SOCKET FOR A MEMORY CARD

1 BACKGROUND OF THE INVENTION

2 1. Field of the Invention

3 The present invention relates to a socket, and more particularly to a
4 socket for a memory card such as MS card (Memory Stick Card), SD card
5 (Secure Digital Memory Card) and MMC card (Multi Media Card), SM card
6 (Smart Media Card). The socket is integrally formed so as to enhance the
7 capability to use available space and to accord with lightweight, slim, short and
8 compact requirements. Furthermore, the arrangement of different terminals
9 enables the operator to withdraw the memory cards which are securely inserted
10 into the socket easily to ensure the completeness and accuracy of read/write
11 action.

12 2. Description of Related Art

13 With reference to Figs. 24, 25 and 26, it is noted that a conventional
14 socket (50) includes a base (51) and a top cover (52), which requires two
15 different molds to manufacture the base (51) and the top cover (52) respectively
16 such that manufacture cost is high.

17 Furthermore, when the SMC (Smart Media Card) legs (54,55) are
18 received in the base (51), the operator will have to change the usual habit to
19 adapt to the configuration of the conventional socket (50). Again, when the MS
20 (Memory Stick) card (40) is implemented to the socket (50), usually, the operator
21 will deem that the side with the connection plates is the bottom side such that
22 when the contacts (56) are received in the base (51), the withdraw direction of

1 the MS card (40) is not so adapted to meet with the conventional withdrawn
2 direction of the SM card (40).

3 To overcome the shortcomings, the present invention tends to provide an
4 improved socket to mitigate the aforementioned problems.

5 SUMMARY OF THE INVENTION

6 The primary objective of the present invention is to provide an improved
7 socket which is integrally formed so that the capability to use available space is
8 enhanced.

9 Another objective of the present invention is that the memory card
10 withdrawn direction is so adapted that the operator is able to easily accomplish
11 the action.

12 Yet another objective of the present invention is that the terminals have
13 welding points to secure the positioning of the terminals.

14 Still another objective of the present invention is that after the memory
15 card is inserted into the socket, the memory card is securely sandwiched to
16 secure the completeness and accuracy of read and write action.

17 Other objects, advantages and novel features of the invention will
18 become more apparent from the following detailed description when taken in
19 conjunction with the accompanying drawings.

20 BRIEF DESCRIPTION OF THE DRAWINGS

21 Fig. 1 is perspective view of the socket of the present invention;

22 Fig. 2 is a partial exploded perspective view of the socket of the present
23 invention;

1 Fig. 3 is a partial exploded perspective view of the socket of the present
2 invention;

3 Fig. 4 is still a partial exploded perspective view of the socket of the
4 present invention;

5 Fig. 5 is a partial perspective view showing the bottom configuration of
6 the base of the socket of the present invention;

7 Fig. 6 is a front plan view of the socket of the present invention;

8 Fig. 7 is a cross sectional view of line 7-7 in Fig. 6;

9 Fig. 8 is a schematic cross sectional view showing the engagement of the
10 MS card with the socket of the present invention;

11 Fig. 9 is a bottom plan view of Fig. 8;

12 Fig. 10 is a cross sectional view of line 10-10 in Fig. 9;

13 Fig. 11 is a schematic cross sectional view showing the engagement of
14 the SD card with the socket of the present invention;

15 Fig. 12 is a bottom plan view of Fig. 11;

16 Fig. 13 is a cross sectional view of line 13-13 in Fig. 12;

17 Fig. 14 is a schematic top plan view showing the engagement of the SM
18 card with the socket of the present invention;

19 Fig. 15 is a cross sectional view of line 15-15 in Fig. 14;

20 Fig. 16 is a cross sectional view of line 16-16 in Fig. 14;

21 Fig. 17 is a cross sectional view of line 17-17 in Fig. 14;

22 Fig. 18 a schematic perspective view of a conventional MS card;

23 Fig. 19 is a schematic perspective view of the conventional MS card

1 from another angle;

2 Fig. 20 is a schematic perspective view of a conventional SD card;

3 Fig. 21 is a schematic perspective view of the conventional SD card
4 from another angle;

5 Fig. 22 is a schematic perspective view of a conventional SM card;

6 Fig. 23 is a schematic perspective view of the conventional SM card
7 from another angle;

8 Fig. 24 is a schematic top plan view of a conventional SM card;

9 Fig. 25 is a schematic top plan view of a conventional MS card; and

10 Fig. 26 is an exploded perspective view of a conventional socket.

11 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

12 With reference to Figs. 1 to 5, the socket in accordance with the present
13 invention includes a housing (10), a SD (secure digital) contact (20), a SD card
14 detect contact (30), a SD write protect contact (40), a SM (smart media) contact
15 (50), a SM card detect contact (60), a SM write protect contact (70) and a MS
16 (memory stick) contact (80).

17 The housing (10) is hollow and integrally formed via injection molding
18 so as to form as an insulator. The housing (10) has a first side (10a) and a second
19 side (10b) opposite to the first side (10a). The first side (10a) has a first baffle
20 (11a) extending from an inner face of the first side (10a) and the second side (10b)
21 has a second baffle (11) extending from an inner face of the second side (10b)
22 toward the first baffle (11a). The first baffle (11a) has a downward extending first
23 wall (110a) to engage with a bottom face of the base (10). The second baffle (11)

1 has a downward extending second wall (110) to engage with the bottom face of
2 the base (10). Due to the downward extending first and second walls (110a,110)
3 and the first baffle (11a) and the second baffle (11), a first slot (12) and a second
4 slot (13) are respectively defined in the housing (10). Furthermore, a pair of first
5 and second guiding grooves (111,112) are defined between the first baffle (11a)
6 and the bottom face of the base (10) and a pair of second guiding grooves
7 (113,114) are also defined between the second baffle (11) and the bottom face of
8 the base (10) opposite to the first guiding grooves (111,112). The housing (10)
9 further has a top side (10d) defining therein a SM terminal hole (14) and two SM
10 protect terminal holes (15,15a). Multiple SM terminal fixing slots (143) are
11 defined in the top side (10d) and composed of long terminal slots (140) and short
12 terminal slots (141). Multiple MS terminal holes (16) are defined in a bottom
13 side (10c) of the housing (10).

14 The SD contact (20) includes multiple SD contact terminals (21) each
15 having a fixed portion (22) with at least a pair of hooks (23) formed on opposite
16 sides of the SD contact terminal (21) to correspond to side faces defining
17 dovetailed holes (131) which are defined in a bottom face defining the second
18 slot (13) to communicate with the second slot (13) and have openings (130) to
19 communicate with the dovetailed holes (131) so that after the SD contact
20 terminals (21) are inserted into the dovetailed slots (130), the hooks (23) are able
21 to securely engage with side faces defining the dovetailed slots (130). Each SD
22 contact terminal (21) further has a wave-patterned contact section (24) formed
23 on a front distal end portion of the SD contact terminal (21) and a welding

1 portion (25) formed on a rear distal end portion opposite to the contact section
2 (24).

3 The SD card detect contact (30) includes a first SD card detect terminal
4 (31) and a second SD card detect terminal (32). The first SD card detect terminal
5 (31) has a fixed portion (311) with a hook (310) formed on a side of the fixed
6 portion (311) to correspond to the first guiding grooves (111) of the housing (10)
7 such that after the first SD card detect terminal (31) is inserted into the
8 corresponding first guiding grooves (111), the hook (310) of the fixed portion
9 (311) is slid in the first guiding grooves (111). A cut is performed in the mediate
10 portion of the first SD card detect terminal (31) to form a resilient contact (313).
11 A contact (315) is formed on a front distal end portion of the first SD card detect
12 terminal (31) and a welding portion (317) is formed on a rear distal end portion
13 of the first SD card detect terminal (31) by bending. The second SD card detect
14 terminal (32) has a fixed portion (322) with a hook (320) formed on a side of the
15 fixed portion (322) to correspond to the second guiding grooves (112) to position
16 the second SD card detect terminal (32) inside the housing (10) and maintain a
17 distance with the first SD card detect terminal (31). A contact plate (324) is
18 formed on a front distal end portion of the second SD card detect terminal (32)
19 and a welding portion (326) is formed at a rear distal end portion of the second
20 SD card detect terminal (32).

21 The SD write protect contact (40) is composed of a first write protect
22 terminal (41) and a second write protect terminal (42). The first write protect
23 terminal (41) has a fixed portion (411) with a hook (410) formed on a side of the

1 fixed portion to correspond to a third guiding grooves (113) in the housing (10)
2 opposite to the first guiding grooves (111) such that after the first write protect
3 terminal (41) is inserted into the third guiding grooves (113), the hook (410) is
4 able to engage with a side face defining the third guiding grooves (113). The first
5 write protect terminal (41) further has a contact plate (413) formed on a front
6 distal end portion thereof and a welding portion (415) formed on a rear distal end
7 portion thereof. The second write protect terminal (42) has a fixed portion (422)
8 with a hook (420) formed on a side of the fixed portion (422) to correspond to a
9 fourth guiding grooves (114) in the housing (10) such that after the second write
10 protect terminal (42) is inserted into the fourth guiding grooves (114), the hook
11 (420) is able to engage with a side face defining the fourth guiding grooves (114).
12 The second write protect terminal (42) further has a contact (424) formed on a
13 front distal end portion thereof and a welding portion (426) formed on a rear
14 distal end portion thereof by bending.

15 The SM contact (50) is composed of multiple SM long terminals (51)
16 and multiple SM short terminals (52). Each of the SM long and short terminals
17 (51,52) has a fixed portion (53) with a pair of opposite hooks (531) on a side of
18 the fixed portion (53) to correspond to the SM terminal fixing slots (143) such
19 that after the SM long terminals (51) and the SM short terminals (52) are inserted
20 into the corresponding SM terminal fixing slots (143), the hooks (531) are able to
21 engage with side faces defining the SM terminal fixing slots (143). Each of the
22 SM long terminals (51) has an extension (511) extending from the fixed portion
23 (53), a wave-line contact section (510) extending from the extension (511) and a

1 welding portion (54) formed on a rear distal end of the fixed portion (53) by
2 bending. The SM short terminals (52) has a wave-like contact section (520)
3 extending directly from the fixed portion (53) and a welding portion (54')
4 formed on a rear distal end of the fixed portion (53') by bending.

5 The SM card detect contact (60) has a first SM card detect terminal (61)
6 corresponding to and to be received in the SM terminal hole (14) of the housing
7 (10) and a second SM card detect terminal (62). The first SM card detect
8 terminal (61) has a contact plate (610) formed on a mediate portion of the first
9 SM card detect terminal (61) and a welding portion (611) formed on a rear distal
10 end thereof.

11 The second SM card detect terminal (62) is also received in the SM
12 terminal hole (14) of the housing (10) and on top of the first SM card detect
13 terminal (61). The second SM card detect terminal (62) has a contact plate (620)
14 formed on a mediate portion thereof and a welding portion (621) on a rear distal
15 end thereof by bending.

16 The SM write protect contact (70) includes a SM long write protect
17 terminal (71) and a SM short write protect terminal (72). Both the SM long write
18 protect terminal (71) and the SM short write protect terminal (72) respectively
19 have a fixed portion (73,74). At least one positioning hole (731,741) is defined in
20 the fixed portion (73,74) to correspond to at least two bosses (151,152) on the
21 top side (10d) of the housing (10) to enable the SM long write protect terminal
22 (71) and the SM short write protect terminal (72) to be riveted on the top side
23 (10d). A contact (75,75a) is formed on a distal end portion of each of the SM

1 long write protect terminal (71) and the SM short write protect terminal (72) and
2 able to extend into the SM protect terminal holes (15,15a) in the top side (10d) of
3 the housing (10). A welding leg (78,79) is formed on another distal end of the
4 SM long write protect terminal (71) and the SM short write protect terminal (72)
5 respectively.

6 The MS contact (80) includes MS contact terminals (81) each having a
7 fixed portion (82), a pair of hooks (83) oppositely formed on the fixed portion
8 (82) to extend into openings (161) of the MS terminal holes (16) and abut side
9 faces defining dovetailed slots (160) communicating with the openings (161). A
10 contact (84) is formed on a front distal end portion of the MS contact terminal
11 (81) to extend out of a corresponding one of the MS terminal holes (16). A
12 welding portion (85) is formed on a rear distal end portion of the MS contact
13 terminal (81). With such a structural arrangement, the socket of the present
14 invention is accomplished and presented in Fig. 1.

15 It is to be noted that the first SD card detect terminal (31), the second SD
16 card detect terminal (32), the first SD write protect terminal (41) and the second
17 SD write protect terminal (42) in Fig. 2 may be provided with a pair of hooks
18 (310,320,410,420) to secure the engagement with the side faces defining the first
19 and second guiding grooves (111,112,113,114).

20 It is necessary to address further that as shown in Fig. 3, the positioning
21 holes (731,741) of the SM long write protect terminal (71) and the SM short
22 write protect terminal (72) and the bosses 151,152) on the top side (10d) of the
23 housing (10) may be provided with two positioning holes (731,741) and two

1 bosses (15,15a) so that the engagement of the SM long write protect terminal (71)
2 and the SM short write protect terminal (72) with the housing (10) is enhanced.

3 A pair of shallow grooves (153,154) may be defined in the top side (10d)
4 of the housing (10) to correspond to and receive therein extensions (76,77) of the
5 SM long write protect terminal (71) and the SM short write protect terminal (72)
6 to secure engagement between the SM long write protect terminal (71) and the
7 SM short write protect terminal (72) with the housing (10). Removal of the
8 positioning holes (731,741) and the bosses (151,152) may result in that the
9 engagement between the SM long write protect terminal (71) and the SM short
10 write protect terminal (72) with the housing (10) depends entirely on the mutual
11 relationship between the fixed portions (73,74) and the extensions (76,77) and
12 the housing (10). A pair of vertical grooves (155,156) are defined to respectively
13 correspond to the welding legs (78,79) and communicate with the shallow
14 grooves (153,154) so that the engagement between the SM long write protect
15 terminal (71) and the SM short write protect terminal (72) with the housing (10)
16 is further secured.

17 With reference to specifically Fig. 4, the housing (10) may further have
18 two recessed areas (18,18a) each with a pair of tracks (181) defined in side walls
19 defining the recessed areas (18,18a) to receive therein a fixing plate (182) which
20 has a welding portion (184) formed on a rear distal end portion of the fixing plate
21 (182).

22 The housing (10) may further have a snapping plate hole (19) and a
23 snapping plate seat (191) provided with a boss (192) and a fixing groove (193).

1 A MS snapping plate (90) has a fixed portion (91) to correspond to and to be
2 received in the fixing groove (193), a positioning hole (92) defined in the fixed
3 portion (91) to correspond to the boss (192) on the snapping plate seat (191) and
4 a snapping contact (93) formed on a front end portion of the MS snapping plate
5 (90). Two pairs of positioning bosses (185,186) may be formed on four corners
6 of the bottom side (10c) of the housing (10) such that precision is enhanced when
7 the housing (10) is placed on top of a PCB (printed circuit board).

8 With reference to Fig. 5, a positioning block (17) is formed on a rear side
9 of the housing (10) and has grooves (171) defined in a side face thereof to
10 correspond to and receive therein the welding portions (54,54') of the SM long
11 terminals (51) and SM short terminals (52) so that inclination of the housing (10)
12 on the PCB is able to be avoided.

13 A pair of guiding grooves (145,146) may be provided in the SM terminal
14 hole (14) to correspond to the SM card detect contact (60) such that engagement
15 card between the first SM card detect terminal (61) and the second SM card
16 detect terminal (62) and the housing (10) is enhanced.

17 With reference to Figs. 6 to 10 and Figs. 18, 19 concerning the
18 conventional MS card (1), inside the housing (10) a T-shaped block (115) is
19 provided to separate the resilient contact (313) and the contact (315) of the first
20 SD card detect terminal (31) from the contact plate (324) of the second SD detect
21 terminal (32) after the first and second SD card detect terminals (31,32) are
22 inserted into the first and second guiding grooves (111,112).

23 Furthermore, a positioning block (116,117) for positioning the memory

1 card is formed inside the housing (10). An outer contour (116a) of the
2 positioning block (116) corresponds to and mates with the snapping contact (93)
3 of the MS snapping plate (90).

4 When the MS card (1) is inserted into the housing (10) along the first and
5 second walls (110,110a), the positioning block (117) stops a positioning cutout
6 (1a) in the MS card (1) and the snapping contact (93) of the MS snapping plate
7 (90) extends into a positioning hole (1b) in the MS card (1) to secure the MS card
8 (1). The contact (84) of the MS contact terminal (81) engages with a connection
9 plate (1c) on the MS card (1).

10 With reference to Figs. 11 to 13 and Figs. 20, 21 concerning the
11 conventional SD card (2), when the SD card (2) is inserted into the second slot
12 (13) in the housing (10) along the first and second walls (110,110a) and when a
13 write protect switch (2d) on the SD card (2) is on (e.g. to prevent any information
14 from inputting into the SD card (2)), the contact plate (413) of the first SD write
15 protect terminal (41) extends into the read/write hole (2e) in the SD card (2) so
16 that the contact plate (413) will not engage with the contact (424) of the second
17 write protect terminal (42) and therefore information is prevented from entering
18 the SD card (2). However, when the write protect switch (2d) is off (e.g. to allow
19 information to enter the SD card (2)), the write protect switch (2d) engages with
20 the contact plate (413) to force the contact plate (413) to engage the contact (424)
21 of the second write protect terminal (42). Thereafter, information is able to be
22 entered the SD card (2). Furthermore, the front end (2a) of the SD card (2)
23 engages with the positioning block (116) and the right side (2b) of the SD card (2)

1 engages with the contact plate (324) of the second SD card detect terminal (32)
2 to force the contact (324) to engage with the contact (315) of the first SD card
3 detect terminal (31). The resilient contact (313) of the first SD card detect
4 terminal (31) is extendable into the positioning hole (2c) of the SD card (2). The
5 contact section (24) of the SD contact terminal (21) engages with the connection
6 plate (2f) of the SD card (2). With the foregoing structure, the conventional
7 connection between the SD card and the housing is improved. The accuracy of
8 information retrieval and input is ensured with the assistance of the SD card
9 detect contact (30) and the SD write protect contact (40). Still, because the MMC
10 card (not shown) differs from the SD card (2) in the quantity of the contact legs,
11 the MMC card may also be applied to the socket of the present invention.

12 With reference to Figs. 14 to 17 and Figs. 22 to 23, when the SM card (3)
13 is inserted into the first slot (12) in the housing (10), the front end (3a) of the SM
14 card (3) abuts a bottom end face (118) defining the second slot (12) of the
15 housing (10) and the SM card (3) is supported by the first and second baffles
16 (11a,11) and a protrusion (119) on the bottom face defining the second slot (12).
17 The contacts (75,75a) of the SM long write protect terminal (71) and the SM
18 short write protect terminal (72) engage with the connection plate (3b) of the SM
19 card (3). Simultaneously, the SM card (3) engages with the contact plate (620) of
20 the second SM card detect terminal (62) to force the contact plate (620) to
21 engage with the contact plate (610) of the first SM card detect terminal (61).
22 Moreover, the contact sections (510,520) of the SM long and short terminals
23 (51,52) connect to the connection plate (3c) of the SM card (3). Because the SM

1 card (3) travels a great deal depth in the housing (10) and there are multiple SM
2 long and short terminals (51,52), a proper clamping force to the SM card (3) is
3 thus provided.

4 In summary, the socket of the present invention has the following
5 advantages:

- 6 1. The housing (10) is integrally formed so that the socket has better
7 ability to use available space inside the space and thus the size of the
8 housing is compact.
- 9 2. The insertion and removal of different memory cards are integrated to
10 adapt to the usual habit of the operator so that confusion is avoided.
- 11 3. Different contacts are inserted into the housing such that assembly is
12 easy. Furthermore, each contact is provided with a welding portion so
13 that inclination of the contact relative to the housing is avoided.
- 14 4. Due to the co-operation between the first and second SD card detect
15 terminals (31,32) and the first and second SD write protect terminals
16 (41,42), the SD card (2) is securely inserted into the housing (10) and
17 thus a write and read action to the SD card (2) is accurate.
- 18 5. With the provision of the T-shaped block (115), the first and second
19 SD card detect terminals (31,32) are safely separated to avoid
20 inappropriate engagement therebetween.
- 21 6. With the provision of the snapping plate (90), the MS card (1) is
22 securely clamped to ensure accuracy of information read and write
23 movement.

1 7. The SM long write protect terminal and SM short write protect
2 terminal (71,72) are received in the corresponding shallow grooves
3 (153,154) in the housing (10) so as to enhance the space utilization
4 capability of the socket of the present invention.

5 It is to be understood, however, that even though numerous
6 characteristics and advantages of the present invention have been set forth in the
7 foregoing description, together with details of the structure and function of the
8 invention, the disclosure is illustrative only, and changes may be made in detail,
9 especially in matters of shape, size, and arrangement of parts within the
10 principles of the invention to the full extent indicated by the broad general
11 meaning of the terms in which the appended claims are expressed.